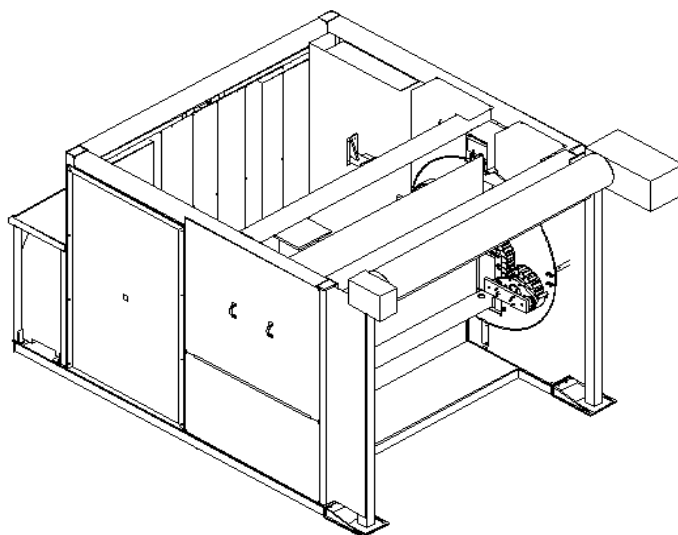
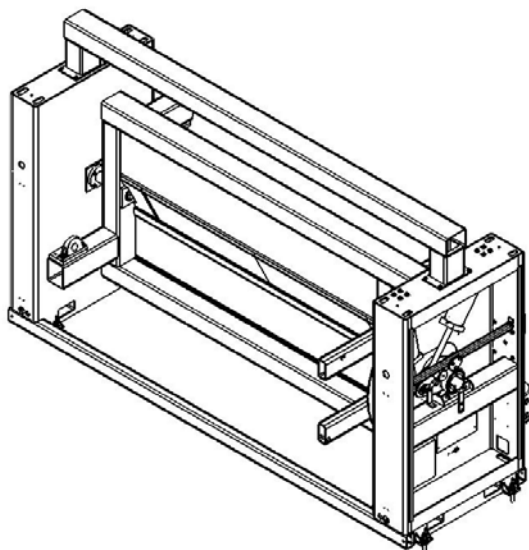

Ferris Wheel Positioner

Versa 4M, CRZ-FW



User's Manual

PLATFORMATION

ROBOTIC WORKCELL PLATFORMS

by  **Genesis Systems Group**



Important Safety Information

Genesis Systems Group is concerned with the safety and welfare of its customers and their employees. Careful consideration has been given to the design and integration of safety hardware and software into this system. The safety equipment is intended as a supplement to the customer's complete safety program for this installation. **These safety precautions are not meant to replace any related Federal, State or Municipal laws, regulations, or guidelines pertaining to safety.**

Genesis Systems Group believes that the appropriate levels of safety for an installation can best be determined by safety professionals who are most familiar with the intended application. **It is the responsibility of the customer** to insure that this level of safety is accomplished. We recommend that each customer consult with safety professionals in order to provide a workplace that allows for the safe application, use, and operation of this system.

For further information contact:

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Davenport, IA 52806
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Version 041307

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 Genesis® Systems Group

**24 HOUR
HOTLINE**

**For a PRODUCTION machine that is DOWN
AFTER regular business hours call:**

(563) 386-9693

**For all other TROUBLESHOOTING and
TECHNICAL SUPPORT call:**

(563) 445-5600

**Regular business hours:
7:30 a.m. – 5:00 p.m. Central Time**

***Please have your shop order number (SO or J #) and
your documentation readily available when
calling for assistance on your system.**



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Positioner Installation

Installation of the Positioner involves leveling and anchoring the Positioner, setting up the air supply, balancing the tooling, and mounting the tooling.

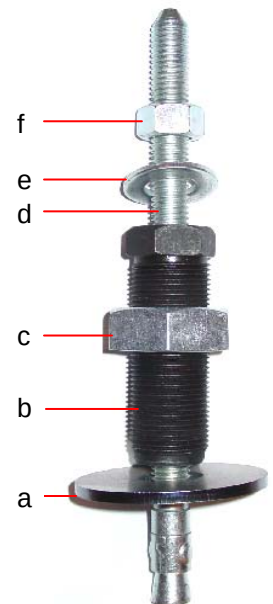
Leveling and Anchoring

Parts supplied with system (one per anchor point):

- a) leveling pad
- b) 1¼ inch leveling bolt
- c) 1½ inch leveling nut
- d) 5/8 inch anchor bolt (length varies)
- e) 7/8 inch washer
- f) 5/8 inch anchor nut

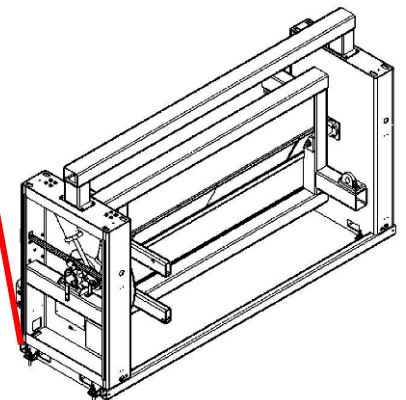
Tools supplied by user:

- Level
- Drill
- 1½ inch Socket wrench
- 15/16 inch Socket wrench
- 3 lb. Mallet hammer



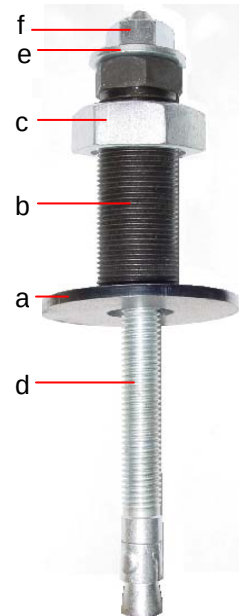
To ensure proper operation, the Positioner must be level front-to-back and side-to-side. To level the Positioner, perform the following steps:

1. Locate all anchor holes.
2. Place a leveling pad (a) on the floor under each anchor hole, aligning the center of each pad with the center of each threaded anchor hole.
3. Thread a nut (c) onto each leveling bolt (b). Thread the nut all the way up the bolt. Thread a bolt/nut assembly (b,c) into each anchor hole until bolt touches leveling pad (a).
4. Place a level on the Positioner at various locations and adjust the height of each bolt (b) as necessary, until the Positioner is level front-to-back and side-to-side.



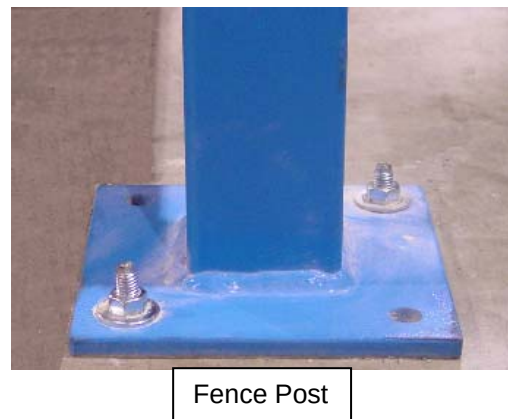
After leveling the Positioner, anchor it into position by performing the following steps:

5. Going through the center of each leveling bolt (b) with a 5/8 inch drill bit, drill into the cement floor about 1 inch farther than the length of the anchor bolt (d).
6. Add a washer (e) and nut (f) to each anchor bolt (d). Insert an anchor bolt assembly (d,e,f) through the leveling bolt, down into the floor.
7. Using a mallet hammer, pound down on the anchor bolt until the washer is flush with the leveling bolt (d).
8. Use a 15/16 inch wrench to hand tighten anchor nut (f).
9. Use a 1 ½ inch socket wrench to hand tighten each leveling nut (c).



If the Positioner has fence posts, anchor each post with 3/8 inch anchor bolts and nuts (usually four holes per post):

10. Going through each hole with a 3/8 inch drill bit, drill into the cement floor about one inch farther than the length of the anchor bolt.
11. Add a 3/8 inch washer and nut to each anchor bolt. Insert a washer/nut/bolt assembly through each hole, down into the floor.
12. Using a mallet hammer, pound down on the anchor bolt until it is about an inch above the floor bracket.
13. Use a 9/16 inch wrench to hand tighten each leveling nut.



Air Supply

The air supply must conform to the following specifications:

- Unrestricted 1/2" minimum inside diameter supply line
- Filtered, moisture-free compressed air at 80 psi minimum
- 130 cfm rating @ 2 indexes per/minute

Tooling Installation

Balancing Tool

For proper tooling installation, the tool must be balanced within specifications. This involves:

1. Finding total weight of tool plus parts.
2. Locating center of gravity
3. Calculating imbalance torque
4. Possibly altering assembly or using counterweights.

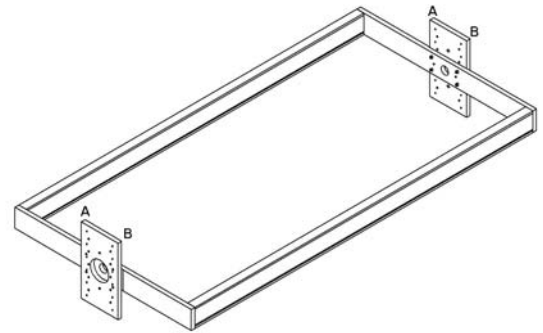
1. Find Total Tool/Part Weight

Determine the total weight of the tool plus parts by weighing the tool/part assembly.

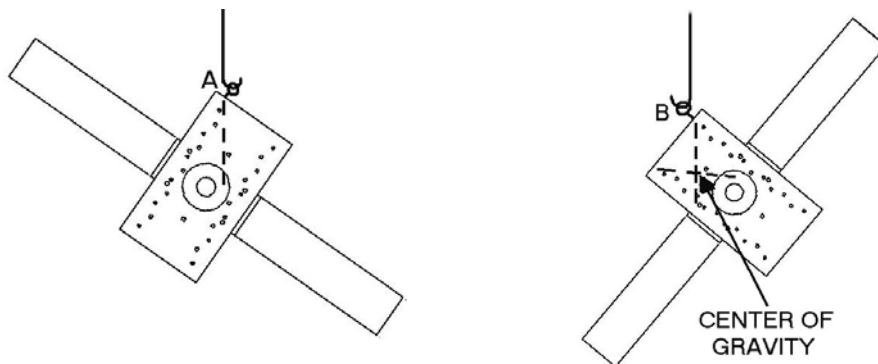
2. Locate Center of Gravity

If the center of gravity for the backbone (frame), tooling, and parts to be welded cannot be calculated easily, use the Crane-and-Plumb-Bob method:

1. Lift the assembly using two hooks. Place the first hook where an “A” is located, then place the other hook at the “A” on the other end. Lift the assembly and use a plumb-bob to mark a vertical line directly below the lifting point.
2. Set the assembly down and lift it again, but this time use the two points marked “B”. Again, mark a line straight down from the lifting points.



Where the two lines, A and B, intersect is the center of gravity for the assembly in two dimensions. The third dimension does not present a problem when dealing with Torque Imbalance and can be ignored.

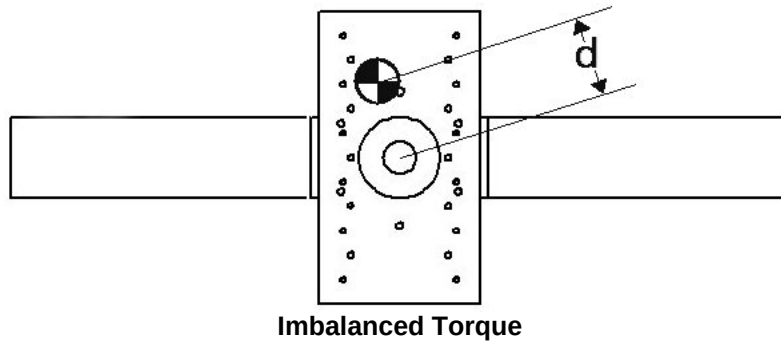


Crane-and-Plumb-Bob Method

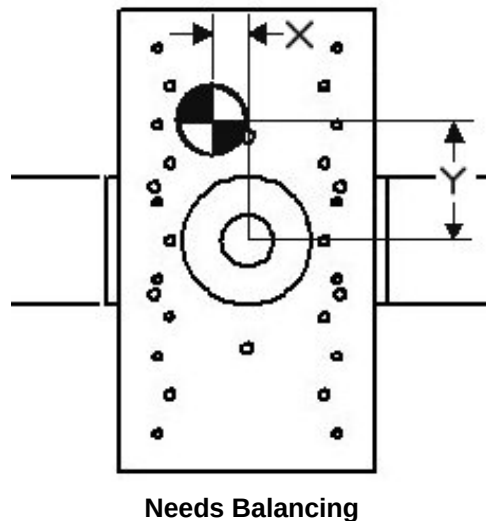
3. Calculate Imbalance Torque

After finding the total weight of the tool/part assembly and locating the center of gravity, the Imbalance Torque must be calculated. The Imbalance Torque (T_I) is the product of the weight in lbs.(W), and the distance in inches from the axis of rotation to the center of gravity (d).

Equation: $T_I = W * d$



The calculated value, T_I , **must be less than 600 in-lbs.** If it is not, the tooling and backbone need to be altered so the center of gravity moves closer to the axis of rotation. Another solution is to balance the setup using counterweights to move the center of gravity.



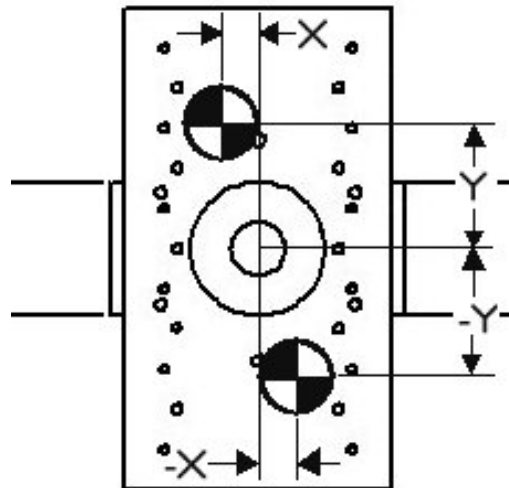
4. Alter Assembly or Use Counterweights

Alter Assembly

If the tooling, backbone, and objects to be welded are adjusted to change the center of gravity, recheck the center of gravity using the Crane-and-Plumb-Bob method. Then recalculate T_I . If T_I is less than 600 in-lbs, further alteration is not needed. If T_I is too large, continue to alter the assembly or consider using counterweights.

Use Counterweights

Counterweights can be used to alter an assembly's center of gravity. If the center of gravity lies at (X, Y) from the axis of rotation, then the assembly must be balanced so that $T_I < 600$ in-lbs. The easiest way to do this is to determine the weight acting at point (X, Y), then place a counterbalance of the same weight at point (-X, -Y). This will result in a balanced assembly. Also, if the weight needed at (-X, -Y) is too great, doubling the distance (-2X, -2Y) will allow the counterbalance weight to be halved.



Balanced Assembly

IMPORTANT!: If counterweights are used, they must remain inside the Swing Radius.

If a counterweight is used to alter the center of gravity, recheck the center of gravity using the Crane-and-Plumb-Bob method. Then recalculate T_I . If T_I is less than 600 in-lbs, further alteration is not needed. Make sure W includes the counterbalance weight. Also, make sure the gearbox has a high enough value.

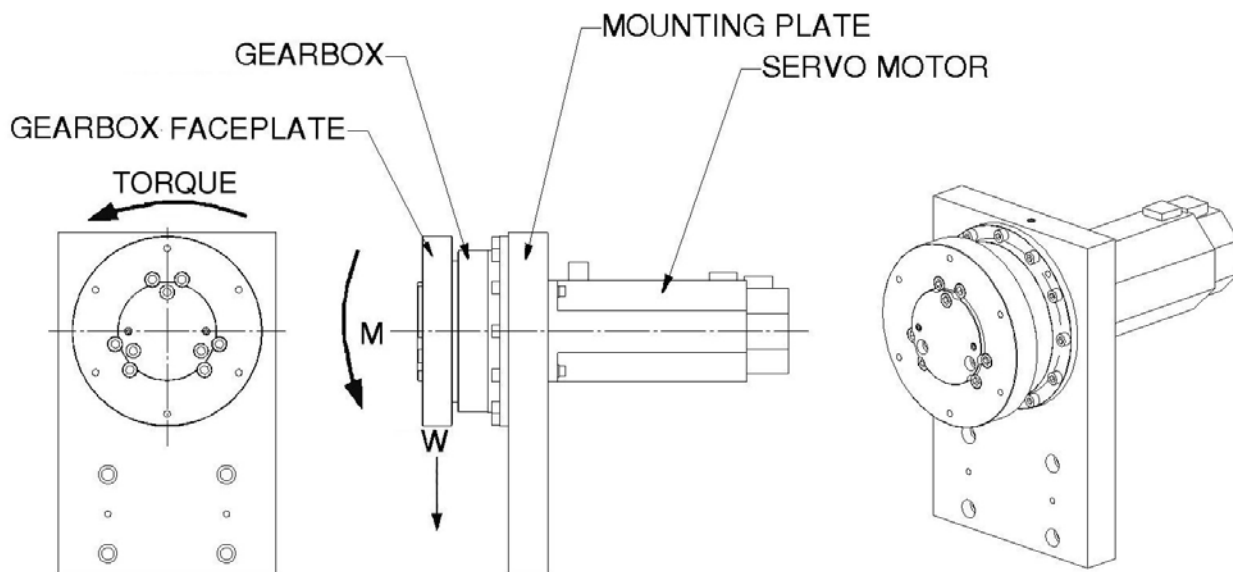
Mounting Tool

In a standard minor axis tooling installation, with a bearing at the tailstock end, the headstock end remains fixed while the tailstock bearing is simply supported. This allows the tooling shaft to move axially as the tooling deflects and pivots about the bearing.

To maintain structural integrity required of the Positioner, certain tooling specifications must be met.

Gearbox Mounting Plate

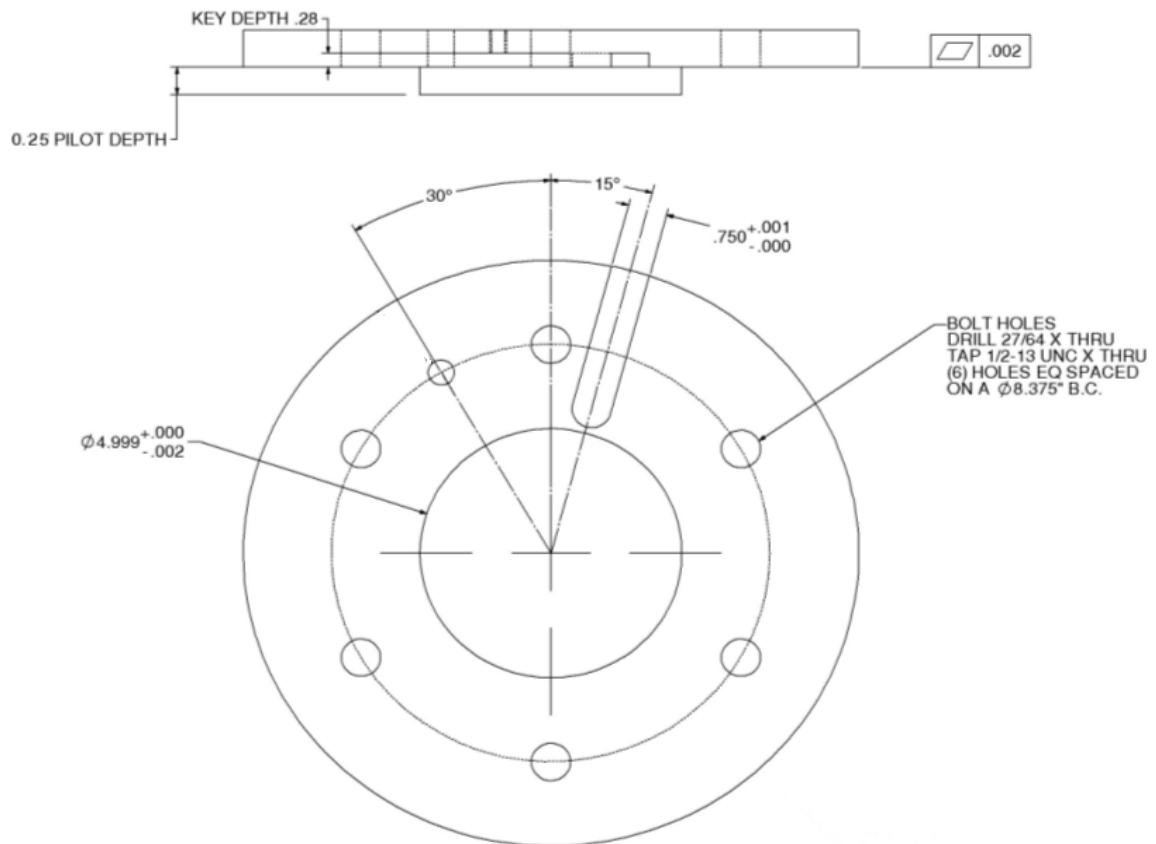
Tooling mounting plates must mate with gearbox faceplates provided by Genesis Systems Group.



Gearbox Faceplate

Each RV gearbox faceplate conforms to the specifications shown in the following diagram.

NOTE: Tooling should be mounted with ½ -13 grade 8 bolts and torqued to SAE standards.



Gearbox Faceplate for RV Gearbox

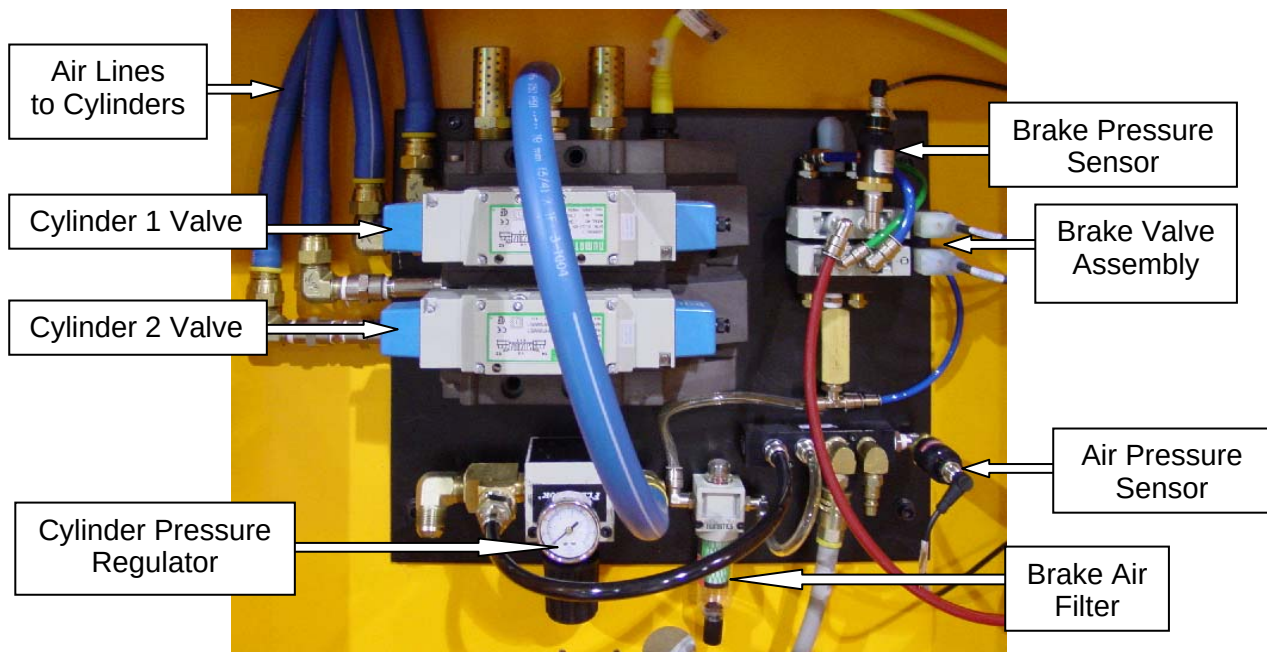
Positioner Control

The Positioner is a system of components that work together to rotate an axis between a load area and a robot area. The axis has two sides, A and B. The components include two pneumatic cylinders, an air package, proximity sensors or limit switches, shock absorbers, and a brake.

Refer to the Plug and Play Manual for control setup, programming, and operation.

Pneumatics Control

The pneumatic valve assembly is mounted inside the cylinder enclosure, at the headstock end of the workcell. Refer to electrical schematics for wiring.



- Unrestricted 1/2" minimum inside diameter supply line
- Filtered, moisture-free compressed air at 80 psi minimum
- 130 cfm rating @ 2 indexes per/minute

Start-up

The Positioner's components must be checked, tested, and possibly adjusted before operations are started. Perform the following steps:

1) Check Shocks, Air, Wiring, Sweep Rotation

Before applying power to the system, complete the following tasks:

1. Make sure shock stiffness is at the setting indicated in the System Specifications table.
2. Make sure air pressure is at the setting indicated in the System Specifications table.
3. Make sure all air lines are tightened and are not in the motion area.



WARNING!

Step 4 could result in unexpected motion of the sweep. Do step 4 **only** if both tools A and B are mounted, or both tools A and B are removed. Gradual motion is expected, but if dramatic movement results, the tooling should be checked for balance. Failure to keep the area clear of people and objects could result in serious injury or even death!

4. Make sure the sweep area is clear, then manually override the brake directional valve. With the brake released, rotate the sweep by hand to check clearances.

2) Test the Sweep

After checking the shocks, air, wiring, and sweep clearances, perform the following steps to test the sweep:



WARNING!

Before performing the following steps, make sure the sweep area and actuating area are clear of people and objects. Failure to keep these areas clear of people and objects could result in serious injury or even death!

1. Make sure the sweep and actuating areas are safe and secure. This should include, but not be limited to, robots clear of sweep, all gates closed, light curtains are functional, and headstock doors are closed or marked as dangerous.
2. Make sure the Emergency stop buttons are functional.
3. Initiate the sweep.

If an error occurs, refer to Start-up Troubleshooting.

The axis should sweep in one smooth, continuous motion. If necessary, make adjustments to the shocks and air pressure. For a system with balanced tooling within the recommended ranges, these external adjustments should be all that is necessary to make the sweep function properly.

For a system with maximum tool weight or unbalanced weights, it may be necessary to adjust parameter values, but first attempt to compensate by adjusting the shocks and air pressure. After making changes to parameters it may be necessary to adjust the shocks and air pressure again.

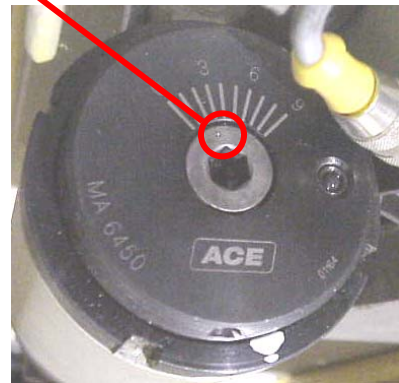
3) Adjust the Sweep

Adjust Shocks

If motion is abruptly reduced or reversed when the sweep contacts the shock, reduce the stiffness of the shock by increasing the setting value. Increase the setting in half number increments **only**. Finer adjustments may be necessary for final adjustment.

If the sweep bounces when it contacts the hard-stop, increase the stiffness of the shock by decreasing the setting value. Decrease the setting in half number increments **only**. Finer adjustments may be necessary for final adjustment.

IMPORTANT!: Do NOT adjust shock setting to less than 2. If setting is less than 2, shock life decreases dramatically.



NOTE: Adjustment settings apply to ACE shocks only. If using different shocks, check the manufacturer's instructions.

Adjust Air Pressure

Air pressure adjustment is not normally necessary but may be required in certain applications. If adjusting air pressure, refer to the System Specifications table for maximum and minimum allowable pressure settings, and note the following guidelines:

Increasing air pressure increases the sweep speed but it also increases the effect of the slowdown. Adjust air pressure in 5 psi increments.

Decreasing air pressure decreases the sweep speed but it also decreases the effect of the slowdown. Adjust air pressure in 5 psi decrements.

Air pressure adjustment also affects brake operation. If air pressure is too low (below 80 psi), the brake will drag on the brake disk, slow the speed of the table, and increase wear on the brake pads.

System Specifications

	CRZ-FW	V4-42	V4-54	V4-60
Capacities				
Exchange Speed	3.5 sec.	4 sec.	5.5 sec.	9 sec.
Maximum Tool Diameter	42"	42"	54"	60"
Available Tool Lengths	1m 1.5m 2m	84" 96" 120"	96" 120" 144"	
Maximum Tool Weight (Per Side)	1200 lbs.	3000 lbs.	5000 lbs.	5000 lbs.
Maximum Tool Imbalance (Rotational)	600in/lbs	600in/lbs	600in/lbs	600in/lbs
Maximum Imbalance Between Tool A and B	50 lbs.	150 lbs.	150 lbs.	150 lbs.
External Adjustment				
Maximum Air Pressure	90 psi.	90 psi.	90 psi.	90 psi.
Minimum Air Pressure	50 psi.	35 psi.	35 psi.	35 psi.
Recommended Air Pressure Setting	80 psi.	70 psi.	60 psi.	50 psi.
Initial Shock Absorber Setting	6	3.5	3	4
Flow Control Setting	2 turns out	n/a	2 turns out	1½ turns out
Software Parameters				
ACOUNT_PRESET	570	700	700	700
BCOUNT_PRESET	100	100	100	100
DZ1L	200	230	230	230
DZ1H	325	395	395	395
DZ2L	345	405	405	405
DZ2H	470	570	570	570
AMAX_START	30	30	18	17
AMIN_START	20	20	13	8
AMAX_END	11	15	8	7
AMIN_END	5	8	2	2
BMAX_START	30	30	18	17
BMIN_START	20	20	13	8
BMAX_END	11	15	8	7
BMIN_END	5	8	2	2
SLOWDN_SIZE	230	300	300	450
RECOVER_MAX	8	16	8	7
RECOVER_MIN	3	5	4	2
Maximum MAX_START Value	35	45	35	35

Start-up Troubleshooting

Problem	Probable Cause	Action
Abnormal Sweep Stop (Plug 'N Play error)	Sweep was not in position when control power was turned on. Undefined condition stopped sweep.	Recover sweep to Side A or B.
Air Pressure Below Recommended PSI	Air supply shut off valve closed. User air supply insufficient. Improperly adjusted or faulty regulator. Improperly adjusted or faulty pressure switch.	Check status of shut-off valve. Check user air supply. Check functionality of regulator. Check functionality of pressure switch
Brake Release Fuse Blown (Plug 'N Play error)	Fuse is bad or wiring is faulty.	Check fuse and wiring. See electrical schematics for your system.
Brake Pressure Errors (Plug 'N Play error)	Brake pressure not present while output off.	Verify both brake solenoids are acting at same time. Check for main air pressure.
	Brake pressure present while output on.	
Control Power is Off	System E-stopped or faulty wiring.	Check status of E-string and wiring.
Extend Cylinder #1 Fuse Blown (Plug 'N Play error)	Fuse is bad or wiring is faulty.	Check fuse and wiring. See electrical schematics for your system.
Extend Cylinder #2 Fuse Blown (Plug 'N Play error)	Fuse is bad or wiring is faulty.	Check fuse and wiring. See electrical schematics for your system.
Possible A at Robot Proximity Sensor Failure	Faulty proximity sensor or wiring.	Check functionality of proximity sensor. Check wiring. See electrical schematics for your system.
Possible B at Robot Proximity Sensor Failure	Faulty proximity sensor or wiring.	Check functionality of proximity sensor. Check wiring. See electrical schematics for your system.
Possible Encoder Malfunction (Plug 'N Play error)	Encoder wheel not contacting actuator arm. Encoder channels A and B reversed. Faulty wiring. Pull-up resistors not functioning.	Make sure wheel is contacting actuator arm. Manually move encoder wheel back and forth while monitoring inputs 0 and 1 on PLC. If Inputs do not flicker when wheel is moved check wiring. See electrical schematics for your system.
Retract Cylinder #1 Fuse Blown (Plug 'N Play error)	Fuse is bad or wiring is faulty.	Check fuse and wiring. See electrical schematics for your system.
Retract Cylinder #2 Fuse Blown (Plug 'N Play error)	Fuse is bad or wiring is faulty.	Check fuse and wiring. See electrical schematics for your system.

Start-up Troubleshooting (continued)

Problem	Probable Cause	Action
Sweep stops just after leaving hard-stop.	Encoder signals reversed. Sweep Position value out of range (Plug 'N Play error). Safety circuit problem.	Check wiring of inputs 0 and 1. Recover sweep to either Side A or B and cycle control power. This will reinitialize the position count.
E-STOP occurs as soon as sweep begins.	Light curtain blocked or malfunctioning. Gate safety contact faulty. Faulty wiring in E-String. Safety circuit problem.	Test functionality of light curtain and gates or other safety device associated with sweep protection. Check user wiring.
Sweep hesitates mid sweep.	Directional valves controlling wrong cylinder. Brake drag.	Check valve wiring. See electrical schematics for your system. Check pneumatic plumbing. Check air pressure.
Sweep strikes hard-stop harshly and bounces in both directions of sweep.	Shocks stiffness too low. Tool imbalance too great for current parameter settings. Air pressure not sufficient for full slowing power.	Check shock settings. Replace shock if adjustments do not change characteristics of shock. Adjust parameter settings. Check regulator setting.
Sweep strikes hard-stop harshly and bounces in only one sweep direction.	Shock stiffness too low. Directional valve not able to apply retract pressure. Tool balance too great for current parameter settings.	Check shock settings. Replace shock if adjustments do not change characteristics of shock. Check functionality of directional valves to see if condition has been caused by a faulty coil on retract side of valve. This would also make the beginning of the sweep slower than normal but the sweep would still complete. Adjust parameter settings.
Sweep comes to complete stop before reaching hard-stop and then completes sweep.	Shock stiffness too high. Sweep MAX_END parameter too low. Air pressure too high.	Check shock. Replace shock if adjustments do not change characteristics of shock. Adjust parameter settings. Check regulator setting.
Sweep comes to complete stop or reverses direction before reaching hard-stop and then slams into hard top with bouncing.	Sweep MAX parameter slowdown slope too aggressive. Sweep MIN_END parameter may be too high.	Adjust parameter settings. .

Lockout/Tagout

Only trained personnel should perform maintenance. The following lockout/tagout procedures should be followed before performing any maintenance. In addition to these procedures, other practices may be needed. **It is the responsibility of the customer to consult safety professionals to determine and apply the best safety practices.**



WARNING!

Before performing any maintenance, use lockout/tagout procedures to prevent system operation. Failure to prevent operation could result in serious injury or even death!

Electrical

To prevent electrical power to the system from being turned on:

1. Turn the main enclosure's main disconnect to OFF.
2. Secure knife switch with a lockout/tagout device and padlock.



WARNING!

Lethal voltage is present in the enclosure whenever it is connected to a power source. Be extremely careful to avoid electrical shock.

Turning the disconnect or knife switch to OFF removes power from the output side of the device only. High voltage is always present at the input side whenever the enclosure is connected to a power source.



Air

To prevent system air from being turned on:

1. Push the blocking valve down.
2. Secure valve with a lockout/tagout device and padlock.



System

To prevent system operation, press an E-stop button:

Shielding Gas

At the user supplied valve, turn off the shielding gas before performing any maintenance.



Tooling

Make sure all parts are removed.

Maintenance

Proper maintenance of the Positioner is essential for maintaining its optimum operating condition. Perform maintenance according to the schedules recommended in this manual. Also, refer to component manufacturers' documentation for additional maintenance instructions.

Before Every Shift

Positioner

Clean the positioner and remove any objects that are not needed for safe operation of the system. Remove excessive spatter and dust build-up on the work surfaces.

Air Pressure

Check air pressure. Make sure it is 80 – 100 psi.

Emergency stop Buttons

Check that every E-stop button stops table rotation.



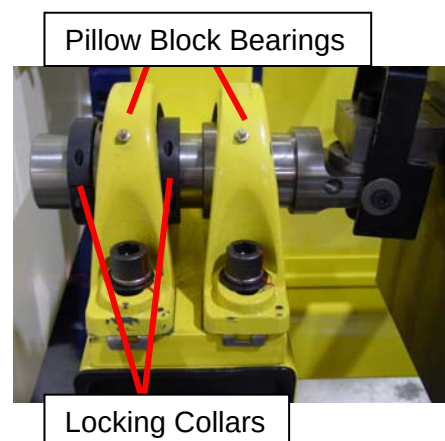
Weekly

Cable and Hoses

Check all external cables and flexible hoses for damage. Check hoses for abrasion, cracking, kinks and burns. Repair or replace as required, being careful to reroute hoses properly.

Axis Bearings & Locking Collars

Pillow block bearings are located at the tailstock ends of the axes. These bearings are greased before being shipped. They do not require any further lubrication or maintenance. Make sure the locking collars are tight.



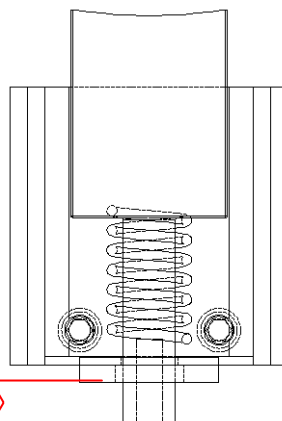
Gearboxes

A servo driven gearbox is located at the head of each minor axis. These gearboxes are greased before being shipped. They do not require further lubrication except for changing the grease every 20,000 hours of operation. They should be inspected for leaks. Check for fluid on the underside of the gearbox and faceplate, and on the floor. If a unit is leaking, call Genesis Systems Group.

Ground Brush

A ground brush may be located at the end of each minor axis. Once a week, lubricate each brush. To lubricate, pull back on the copper unit. Cover the entire surface of the copper unit (wherever it comes in contact with the axis) with a thin coat of 'Tweco Electrical Joint Compound and Lubricant'.

Replace ground brush when this distance is less than 24 mm (.93 inches)



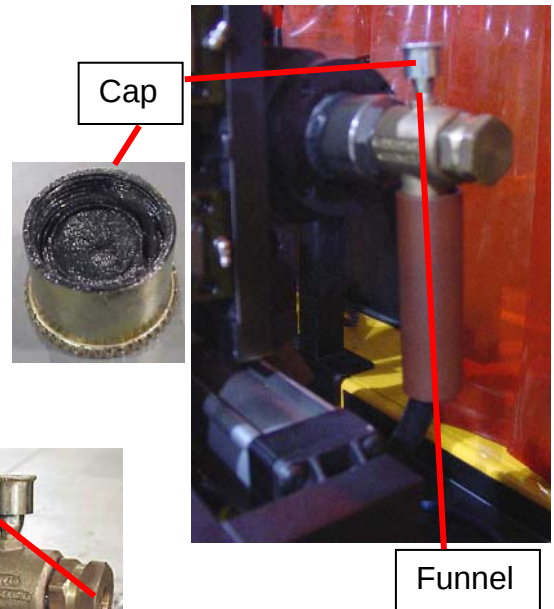
Roto-Ground Clamps

Roto-Ground clamps may be located at the end of each minor axis. The units are lubricated before being shipped. Once a week, turn the cap one full turn (360°). Turning the cap forces lubricant into the unit. When the cap is fully screwed down (can no longer be turned), then add lubricant. To add lubricant, perform the following steps:

1. Remove the cap.
2. Fill the funnel and cap with 'Tweco Electrical Joint Compound and Lubricant'.
3. Screw the cap back on, turning only until resistance is felt.

Make sure roto-ground is tight on the tailstock shaft (torqued to 90 ft.-lbs.).

Make sure unit makes firm contact with shaft yet is able to rotate. Hand-tighten bolt with wrench (snug), then back off 1/4 turn.



Semiannually

Brake

IMPORTANT!: Make sure the air supply to the system is OFF.

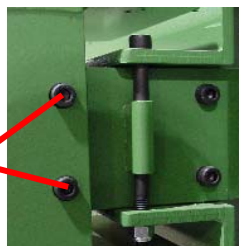


WARNING!

Perform brake maintenance every **six months**. Failure to perform maintenance could lead to brake malfunction, and possibly cause serious injury or death!

Brake Cover (Housing)

Carefully remove the brake cover (housing). It is attached to the air bag and to hoses. Remove the cover by removing the two mounting bolts.



Actuators

With the air supply to the brake OFF, make sure the left and right actuators are parallel to each other. If they are not parallel, adjust them using the brake's two pivot bolts.

Brake Pads

Check brake pads for wear. If pads are less than 1/8th inch thick, replace them.

Air Bag

Check the air bag and air valve for leaks by looking (with safety glasses on) and listening. Control power must be on.

Muffler

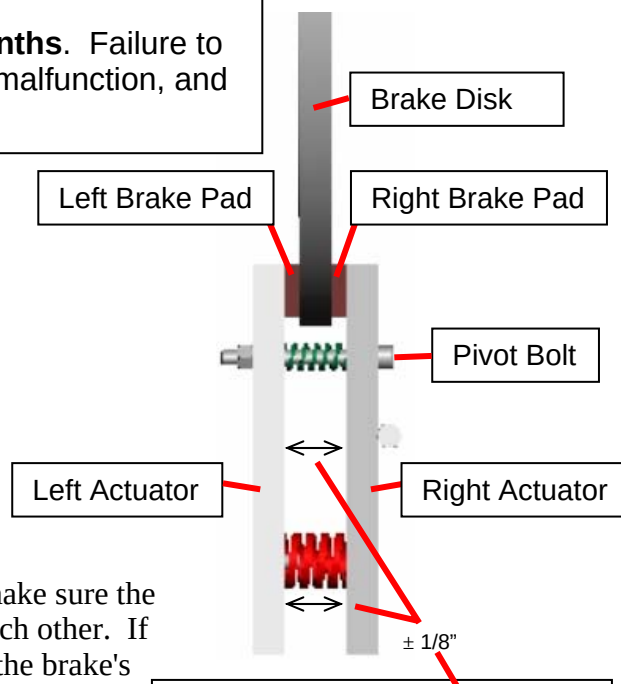
Use **only** a **clean** UCI MHC-3 or NUMATICS M3MN muffler on the brake's air bag.



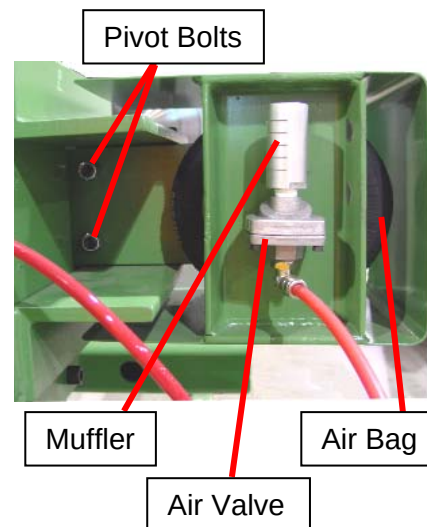
UCI MHC-3



NUMATICS M3MN



IMPORTANT! The actuators must be parallel to each other. Measure from the inside of the left actuator, to the inside of the right actuator (in two places), making sure measurements are within $\pm 1/8$ inch of each other.



Air Filters

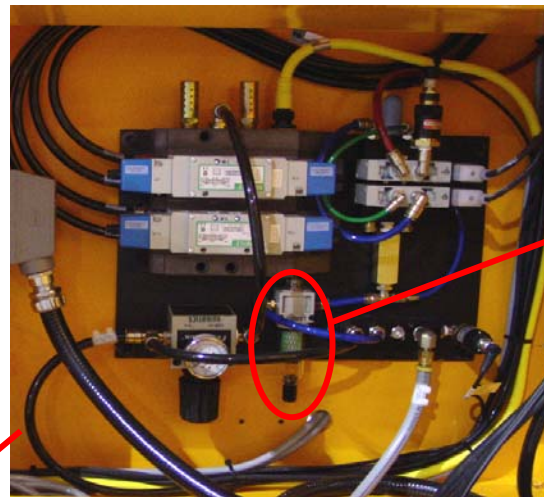
Brake

Every six months, inspect the brake air filter. If the filter is discolored (not white), replace it with the same type and brand.



WARNING!

Inspect the brake air filter every **six months**. Failure to perform maintenance could lead to brake malfunction, and possibly cause serious injury or death!



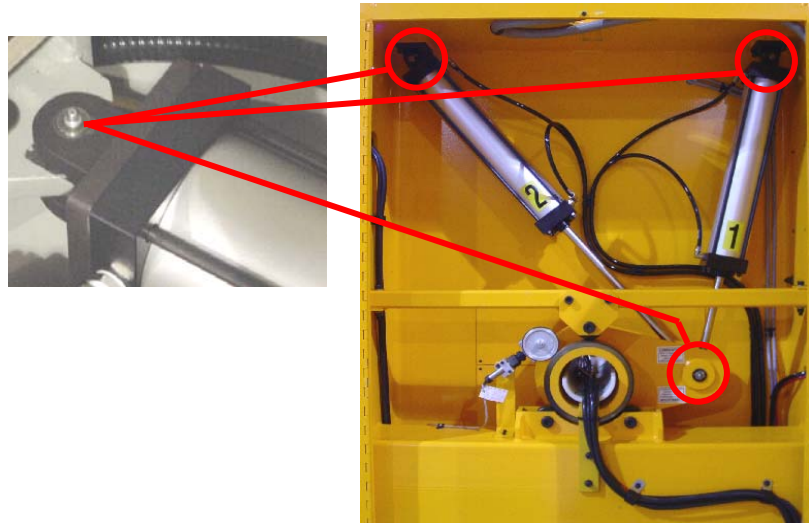
System

Every six months, inspect the system air filter. It is located either near the peripheral equipment or in the headstock enclosure. Look through the sight glass. If the unit is dirty, disassemble and clean it, or replace it.



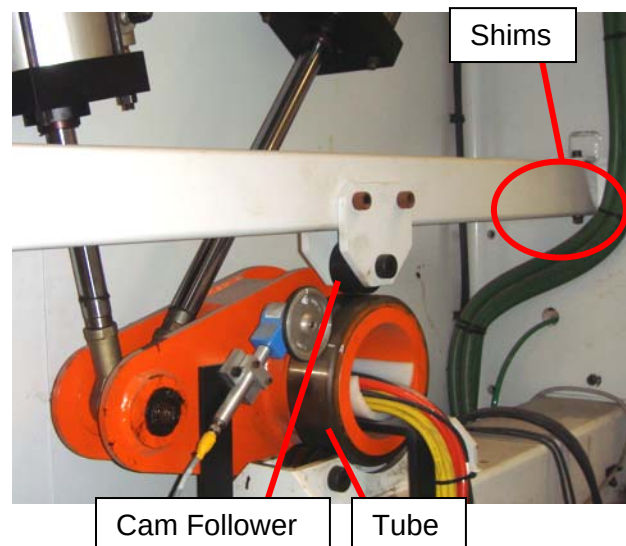
Cylinders

The two cylinders at the headstock end of the major axis have three grease fittings. Give each fitting one pump of a high-quality lithium based NLGI #2 or #3 bearing grease.



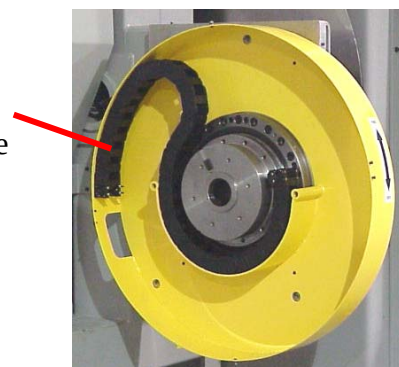
Cam Followers

The system has three cam followers at the headstock end. Give each cam follower one pump of a high-quality lithium based NLGI #2 or #3 bearing grease. Make sure the top cam follower is making contact with the tube.



Cable carriers

An energy chain (cable carrier) may be mounted at the headstock end of each minor axis. It carries the power cabling. If the Positioner has an energy chain, visually inspect it. Look for cracked or separated links. Replace if necessary. Make sure all fasteners are tight.



Annually

Proximity Sensors (CRZ-FW)

Proximity sensors (proxes) help ensure accurate positioning of the CRZ-FW's major axis. Proxes are located near the shock absorbers.

Check each proximity sensor for tightness and proper distance from its target. The distance should be such that the LED lights up but the prox does not touch its target. Jam nuts and prox bracket should be firmly tightened. Prox brackets should be fastened with lock nuts/washers and a removable thread locker if necessary. Examine prox cables for abrasion, cracks and burns. Replace as needed, using care when rerouting cables. Hand tighten cable plugs to proxes, being careful to not overtighten. If necessary, wipe proxes with a clean, dry cloth.

IMPORTANT!

Proper alignment of proximity sensors is essential for operations. Use care not to bump or move them. NEVER step on, or set anything on, a sensor or its bracket.



Limit switches (4M)

Limit switches monitor positioning of the 4M's major axis. They are located on either side of the major axis (sweep). Check that the limit switches are fastened securely to the mounting brackets. Check that each cable connector is firmly connected to its switch. Make sure the switches are operating properly.



Shock Absorbers

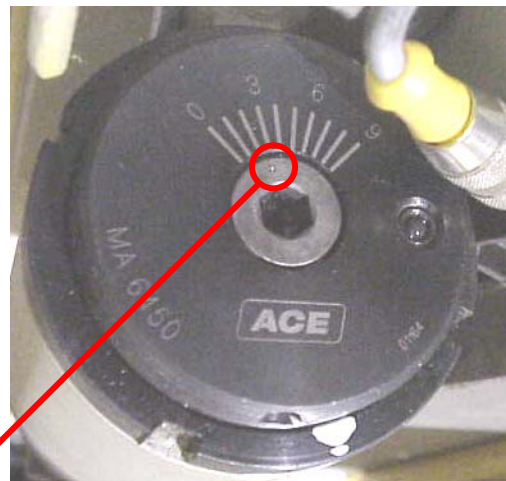
On the 4M, a shock absorber is located on each side of the major axis (two total). On the CRZ-FW, two shock absorbers are located inside the headstock module (with the cylinders, encoder, etc.)

Each shock absorber has two spanner nuts. Check that all spanner nuts are fastened securely. To tighten, use a spanner wrench and apply 75 to 100 lbs of force with about one foot-lever.

Check each shock absorber for leaks. Replace if leaking.

NOTE: If the axis bounces off the hard rest stop at the end of its rotation (noisier than normal), the shock absorbers are too loose. Adjust setting to a lower number.

If the axis bounces off the shock at the end of its rotation, the shock absorbers are too stiff. Adjust setting to a higher number.



To adjust shock absorbers, use an Allen wrench to turn the dial, adjusting (at the most) to the next half number increment. For example, adjust from 3 to 3½ or from 3 to 2½. DO NOT adjust shock absorbers to less than 1½.

NOTE: Adjustment settings apply to ACE shocks only. If using different shocks, check the manufacturer's instructions.

Encoder

If the Positioner has an encoder, the encoder helps ensure accurate positioning of the major axis. Look at the encoder. Make sure it is making contact with the tube. Check the mounting bolt for tightness. Check the connections to the PLC for tightness.



Programmable Logic Controller (PLC)

If the Positioner has a MicroLogix 1000 PLC, the PLC controls the rotation of the major axis. No maintenance is required. The unit does not have a battery. If problems occur with axis rotation (encoder fault), then connections may be loose.

Ground Lug Nuts

Check that each ground lug nut connection is tight.

Tighten size 1/2"-13 to 80 ft.-lbs.

Tighten size 3/8"-16 to 32 ft.-lbs.

Check that each cable is firmly terminated. Examine the 4/0 ground cable insulation for abrasion and cracking. Repair or replace as required. If unable to replace, use electrical tape to cover bare cables until they can be replaced.



Every 20,000 Hours of Operation

Gearboxes

A servo driven gearbox is located at the head of each minor axis. Every 20,000 hours of run time, change the grease in each gearbox. To change the grease:

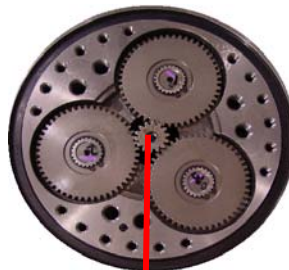
1. Remove the tool.
2. Rotate the axis for about 15 minutes to warm up the grease and make it flow more easily.
3. Each gearbox has two plugs. Locations vary depending on the gearbox. It may be that both plugs are on the front side, or one plug is on the front and one on the back. Locate the plugs. Make sure the axis is positioned so that the two plugs are aligned vertically. Remove the plugs.
4. Siphon the grease from the lower hole into an acceptable container. Use CAUTION – grease may be HOT!
5. Pump grease into the lower hole so that the grease works its way up into the gears. Refer to the Gearbox Lubrication Quantities chart to determine the type and quantity of lubrication.
6. Replace plugs.



Horizontal



Vertical



Center shaft

NOTE: Horizontal/vertical refers to the orientation of the center shaft.

Gearbox Lubrication Quantities

MAKE	MODEL	LUBRICANT	APPLICATION	QUANTITY (pints)
SUMITOMO	F2C-T35	OPTIMUM LONGTIME PD0	HORIZONTAL	.40
SUMITOMO	F2C-T35	OPTIMUM LONGTIME PD0	VERTICAL	.51
SUMITOMO	F2C-T45	OPTIMUM LONGTIME PD0	HORIZONTAL	.53
SUMITOMO	F2C-T45	OPTIMUM LONGTIME PD0	VERTICAL	.66
SUMITOMO	F2C-T65	OPTIMUM LONGTIME PD0	HORIZONTAL	1.24
SUMITOMO	F2C-T65	OPTIMUM LONGTIME PD0	VERTICAL	1.54
Nabtesco	RV-40E	MOLYWHITE RE00	HORIZONTAL	.41
Nabtesco	RV-40E	MOLYWHITE RE00	VERTICAL	.5
Nabtesco	RV-80E	MOLYWHITE RE00	HORIZONTAL	.81
Nabtesco	RV-80E	MOLYWHITE RE00	VERTICAL	.97
Nabtesco	RV-110E	MOLYWHITE RE00	HORIZONTAL	.91
Nabtesco	RV-110E	MOLYWHITE RE00	VERTICAL	1.1
Nabtesco	RV-320C	Greased and sealed by manufacturer – no change of grease req'd		
Nabtesco	RV-320E	MOLYWHITE RE00	HORIZONTAL	2.2
Nabtesco	RV-320E	MOLYWHITE RE00	VERTICAL	2.6
Nabtesco	RV-320EL	MOLYWHITE RE00	HORIZONTAL	6.97
Nabtesco	RV-320EL	MOLYWHITE RE00	VERTICAL	5.71
Nabtesco	RV-450E	MOLYWHITE RE00	HORIZONTAL	3.37
Nabtesco	RV-450E	MOLYWHITE RE00	VERTICAL	4.06
Nabtesco	RV-700EL	MOLYWHITE RE00	HORIZONTAL	10.88
Nabtesco	RV-700EL	MOLYWHITE RE00	VERTICAL	13.1
Nabtesco	RV-900C	MOLYWHITE RE00	HORIZONTAL	14.8
Nabtesco	RV-900C	MOLYWHITE RE00	VERTICAL	15.4
Nabtesco	GH7	MOLYWHITE RE00	HORIZONTAL	.275
Nabtesco	GH7	MOLYWHITE RE00	VERTICAL	.254
Nabtesco	GH17	MOLYWHITE RE00	HORIZONTAL	.623
Nabtesco	GH17	MOLYWHITE RE00	VERTICAL	.602
Nabtesco	GH24	MOLYWHITE RE00	HORIZONTAL	.634
Nabtesco	GH24	MOLYWHITE RE00	VERTICAL	.634
Nabtesco	GH40	MOLYWHITE RE00	HORIZONTAL	1.638
Nabtesco	GH40	MOLYWHITE RE00	VERTICAL	1.257
Nabtesco	GH100	MOLYWHITE RE00	HORIZONTAL	3.886
Nabtesco	GH100	MOLYWHITE RE00	VERTICAL	N/A

Maintenance Chart

Use this chart as a reference for doing maintenance and to record the dates when maintenance is done. Also, refer to the component manufacturers' documentation for additional maintenance instructions.

 - check L - lubricate + - clean	Before Every Shift	Weekly	Every Six Months	Annually	Every 20,000 Hours
Positioner	+				
Air pressure					
E-stop buttons					
Cables & hoses					
Locking collars					
Ground brush Roto-ground		L L			
Brake					
Air filters					
Cylinders			L		
Cam followers					
Cable carriers					
Proximity sensors					
Limit switches					
Shock absorbers					
Encoder					
Ground lug nuts					
Gearboxes					L-change

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		tooling mounting plate	6
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fence posts	2	troubleshoot	13
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		valves	8
gas	16	wiring	9
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ground lug nut	25		
hoses	18		
level	1		
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